EFFECT OF PRANAYAMA AND CYCLIC MEDITATION ON SELECTED PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES OF ATHLETES

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A

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I hereby declare that the short synopsis **"Effect of Pranayama and Cyclic Meditation on Selected Physiological and Psychological Variables of Athletes"** being submitted in partial fulfilment of the requirement for the degree of Doctor of Philosophy in Yoga under Department of Yogic Sciences of Lakshmibai National Institute of Physical Education, Gwalior (M.P.) year 2021- 2022.

It is a bonafide record of original work carried out under the supervision of Dr. Sameer Kumar Yadav and has not been submitted in full or part to any other university or institute for a degree or diploma.

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ABSTRACT

Pranayama and meditation are two mind-body practices that are predicted to get more attention in sports science because of their capacity to enhance physiological processes and foster psychological fortitude in athletes. The purpose of this study is to investigate how Pranayama and Cyclic Meditation affect specific physiological and psychological traits in male collegiate athletes. The effectiveness of these yoga techniques, which have their roots in ancient Indian customs, in reducing stress, improving autonomic balance, and cultivating mental focus—qualities essential for athletic success is expected to be further supported by research.

Forty-five male athletes, ages 18 to 25, who play team sports including basketball, football, and hockey in the Gwalior district, will make up the research sample. Three groups—one for Pranayama, one for Cyclic Meditation, and one for Control—will be randomly selected from among the participants. The intervention will take place five days a week for 12 weeks, with 25 to 35 minutes spent in each session. Alpha brain wave activity, resting heart rate, resting respiratory rate, and Galvanic Skin Response are the physiological characteristics that will be examined. Relaxation, confidence, anxiety, visualization, focus, goal-setting, and motivation are among the psychological aspects that will be evaluated.

Data will be gathered using validated tools: Bull's Mental Skills Questionnaire 1996 will be used for psychological assessment, Medicaid Biofeedback equipment will be apply to measure Alpha Brain Waves and GSR, and the Polar FT80 will be utilized to track heart rate. Three time points will be used for measurements: the pre-test baseline, the mid-test 6 weeks, and the post-test 12 weeks. The statistical methods that will be employed include ANOVA and MANOVA.

Keywords: Pranayama, Cyclic Meditation, Alpha Brain Waves, Galvanic Skin Response, Mental Skills factor**.**

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INTRODUCTION

An athlete's performance is now influenced by years of preparation, biomechanical analysis, and sophisticated technical tools rather than just physical training in this age of advanced science and technology (Foster et al., 2017). Performance and injury prevention have been greatly impacted by the way that playing surfaces, clothing, and equipment are designed as a result of advancements in materials science and physics (Haake, 2009). By investigating genetic markers associated with power, endurance, and recovery, molecular biology and genetics are simultaneously advancing our understanding of athletic potential (Pitsiladis et al., 2013).

The importance of physiological efficiency in sports and athletic performance has drawn more and more attention from academics, coaches, and medical experts. In addition to improving physical performance, optimal physiological functioning promotes recuperation, mental clarity, and general wellbeing. Traditional Indian techniques like meditation (mental concentration and awareness) and pranayama (controlled breathing) have demonstrated encouraging outcomes among the several ways to enhance physiological balance (Sengupta, 2012; Telles et al., 2010).

Traditionally practiced for spiritual development and mental clarity, yoga is a centuries-old system of holistic well-being that originated in ancient India. It combines physical postures (asanas), breath regulation (pranayama), and mental discipline (dhyana or meditation). Modern scientific research has increasingly explored yoga's physiological effects, particularly its influence on brain wave activity—a measurable indicator of mental and neural states (Telles et al., 2010; Lomas et al., 2015).

Because the mind is a vortex of fancies, confusions, and oscillations, mental tensions arise from excessive mental activity. Our mental body accumulates the events that our awareness records throughout our lives. These occasionally blow out, impacting our body, mind, behavior, and responses. Since athletes are not an exception, they frequently attribute mental health issues like sadness, anger, or irritation to petty causes. However, cumulative strain on the mental level is the root cause of all men's aberrant conduct. The science of pranayama is precise. After maintaining the steadiness of posture or seat, Asana, it is the control of breath,

or prana, which is the cessation of inhalation and expiration. According to the Bible, "Lord God created man from dust and breathed the breath of life into his nostrils; and man became a living being."(Gen 2:7.)

Pranayama is a psycho-somatic, spiritual discipline that is used in modern civilization to achieve harmony and unity between the mind, body, and soul as well as the ultimate unification of our individual consciousness with global awareness (Madanmohan, 2008).

The Upanishads are the source of the movement meditation technique known as cyclic meditation (CM), which is performed by fusing relaxation techniques with physical postures, or asanas. After a prayer, CM practitioners perform isometric muscle contraction, supine rest, standing comfortably, centring by distributing their body weight across their feet, bending to their right and then left sides (ardhakaticakrasana), forward bending (padahastasana), backward bending (ardhacakrasana), and supine rest. The technique places a strong focus on mindfulness and relaxation (Nagendra and Nagarathna, 1997).

Meditation facilitates a calm mind and healthy lifestyle, helps people conquer their emotions, encourages relaxation, and cultivates a good outlook. Pain, despair, anxiety, and stress can all be considerably reduced by meditation. (2011) Holzel et al.

One of the main components of overcoming athletic training is mental toughness, which enables the brain to communicate with the body and vice versa. The capacity to visualize, prepare mentally, control anxieties and worries, focus, relax, and be motivated are the main components of mental talents. Athletes with strong mental faculties can enhance their abilities and level of performance in their respective sports.

Using mental skills during a competition is the greatest way for athletes to control the elements that lead to subpar performance. The most prevalent problem among athletes of all levels is a lack of confidence, and in order to perform well at a high level, they need to retain a high degree of self-belief.

By managing the stressful situations before to a competition, the athletes might be more effective in reaching their objectives. Mental Skills Training increases the likelihood of becoming as near to those talents as feasible (Stephen Bull, 1996), and mental skills have a favourable impact on athletes' performance and minimize anxiety before to a competition (Behroz, K., 2011).

Strong concentration powers help sportsmen maximize their chances of focusing during important key periods while reducing the effects of internal and external stress and anxiety

factors. The capacity of an athlete's mind to reproduce all relevant sensory information that supports the successful application of skills with appropriate conduct for a given circumstance is known as imagery ability. These cognitive abilities are closely linked to neuro-physiological processes, which training may enhance. High amplitude gradually increasing alpha waves and balanced physiological functioning are frequently linked to strong mental abilities (Mohsen D. et al., 2015)

STATEMENT OF THE PROBLEM

The statement of the problem is stated as **"Effect of pranayama and cyclic meditation on selected physiological and psychological variables of athletes"**.

OBJECTIVES OF THE STUDY

1. To characterize the level of Physiological of Pranayama, meditation and Control Groups of Athletes.
2. To characterize the level of Psychological Variables of Pranayama, meditation and Control Groups of Athletes.
3. To compare pre-test post-test, mean scores of Physiological Variables of Pranayama, and Control Groups of Athletes.
4. To compare pretest post-test, mean scores of Psychological Variables of Pranayama, meditation and Control Groups of Athletes.

HYPOTHESES

On the basis of literature review and own understanding of research scholar the following hypothesis are formed for the purpose of the study:

1. There is no significant difference between pre-test post-test mean scores of Physiological Variables (Alpha Brain Wave, Galvanic skin response (GSR), Resting Heart Rate and Resting Respiratory Rate) of Pranayama, meditation and Control Groups of Athletes.
2. There is no significant difference between pre-test post-test mean scores of Psychological Variables (Relaxation ability, Confidence building, Anxiety, Imagery ability,

Concentration ability, Goal Setting and Motivation) of Pranayama, meditation and Control Groups of Athletes.

3. There is no significant difference between adjusted mean scores of Physiological Variables (Alpha Brain Wave, Galvanic skin response (GSR), Resting Heart Rate and Resting Respiratory Rate) of Pranayama, meditation and Control Groups of Athletes by considering their pre–Physiological Variables (Alpha Brain Wave, Galvanic skin response (GSR), Resting Heart Rate and Resting Respiratory Rate) as a covariate.
4. There is no significant difference between adjusted mean scores of Psychological Variables (Relaxation ability, Confidence building, Anxiety, Imagery ability, Concentration ability, Goal Setting and Motivation) of Pranayama, meditation and Control Groups of Athletes by considering their pre–Psychological Variables (Relaxation ability, Confidence building, Anxiety, Imagery ability, Concentration ability, Goal Setting and Motivation) as a covariate.

DELIMITATIONS

1. The research will only include forty-five male athletes from the Gwalior District who play basketball, football, and hockey at the collegiate level.
2. The subjects are male and range in age from 18 to 25.
3. Only these pranayamas—Nadishodhana, Sheetli, Ujjayi and Bhramari pranayama, and Cyclic meditation will be included in the research.
4. The training will last for only 12 weeks, five days a week, for 25 to 35 minutes each day.
5. The specific physiological and psychological characteristics will be the only focus of the investigation.

SIGNIFICANCE OF THE STUDY

1. This study will help determine the effects of Pranayama and cyclic meditation training on psychological and physiological variables
2. The results of this study will help determine the minimum amount of time and the number of daily meditation sessions at which meditation begins to have a significant effect on selected variables
3. The study will serve as a foundation for future research in this particular area

4. The athlete may benefit from this study by improving psycho-physiological functions that aid in improving sports performance.
5. The athlete may benefit from this study by identifying and analyzing their strengths and weaknesses.

DEFINITIONS AND EXPLANATIONS OF TERM

Cyclic Meditation: Based on the Taittireya and Mandukya Upanishads, Cyclic Meditation is a method of meditation that combines a series of progressive stimulation and relaxation exercises to address the mind's intricate issues (Nagendra 2003).

Heart Rate at Rest (RHR)

Usually measured after waking up and before any physical activity, resting heart rate is the number of heart beats per minute while an individual is completely at rest. It represents the fundamental operation of the cardiovascular system and is impacted by age, degree of fitness, stress, hormones, and the balance of the autonomic nerve system (Hall & Guyton, 2020).

Respiratory Rate

The physiological act of breathing in oxygen and releasing carbon dioxide is known as respiration, and it is crucial for cellular metabolism. The number of breaths per minute, or respiratory rate, is a crucial measure of metabolic demand and pulmonary function (Hall & Guyton, 2020). According to the World Health Organization (2022), a healthy adult's resting respiratory rate typically ranges from 12 to 20 breaths per minute.

Galvanic Skin Response

Also referred to as emotional arousal, the galvanic skin response (GSR), which is a subset of electrodermal activity, or EDA, is the term used to describe variations in sweat gland activity that reflect the intensity of our emotional state. The environment we're in affects our emotional arousal level; whether something is frightening, dangerous, joyous, or otherwise emotionally significant, our emotional reaction alters, which in turn raises eccrine sweat gland activity. Studies have demonstrated the connection between this and emotional arousal.

Alpha Brain Wave:

The most noticeable synchronized rhythmic potential changes are alpha waves, which are often detected in the occipital cortex but may also be seen in the frontal and parietal areas when the brain is at rest and the eyes are closed or dark. When the eyes are open, the alpha wave goes away. Alpha waves are associated with a calm, tension-free, positive, and attentive mental state with very little thinking density. They are linked to inactive consciousness, which is a common feature of meditation. The frequency of alpha waves range from 8 to 13 cycles per second. A calm and attentive mental state is indicated by a slow, high-amplitude rhythmic alpha. Davidson, (R. J. & McEwen, B. S. 2012).

Mental skill Factor: A variety of psychological factors, including motivation, concentration (or attention), confidence, anxiety, and others, influence personality and athletic performance. Athletes need to understand the mental state. the components of sport, their significance, and their function in preserving health and wellbeing (Foo et al., 2023).

LITERATURE REVIEW

Chochalingam, D. (2022) The study's goal was to determine how yoga and meditation affected the stress levels of football players at University College of Engineering in Ramanathapuram, Tamilnadu, India. The population of the research consisted of thirty male football players, ages ranging from 18 to 25, who were chosen at random to serve as subjects. They were split into two equal groups: the Control group (n = 15) and the Experimental group (n = 15). The significance threshold for the test t-ratio in the Perceived Stress Scale Questionnaire was established at the 0.05 level of confidence for this investigation. The mean and standard deviation were calculated in order to analyze the stress data that was gathered. The dependent "t" test was used to statistically analyze the data, and the results showed a significant difference between the Experimental and Control groups. The experimental group was assessed for stress levels before and after a twelve-week meditation and yoga program. According to the study, male collegiate football players must have accurate and pertinent information on mental health in order to survive.

Adhikari, K. (2021) examined an effort has been made to look at how university-level kho-kho players' physiological variables are affected by meditation and pranayama practice. In accordance with a schedule, fifteen male university-level Kho-Kho players who were chosen for the Vidyasagar University Kho-Kho team spent six weeks practicing meditation and pranayama, specifically Shitali Pranayama, Ujjayi Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Kapalbhati Pranayama, and Anuloma & Viloma Pranayama. The physiological factors include blood pressure, respiration rate, and resting heart rate. The Omron Blood Pressure Monitor was used to monitor blood pressure, and the Pulse Oximeter was used to assess the resting heart rate. The findings showed a substantial difference between the pre-test and post-test. Therefore, it was clear that among kho-kho players at the university level, meditation and pranayama practice had a major influence on physiological variables, including resting heart rate, blood pressure, and breathing rate.

Dhanaraj, S. (2021) Examine the effects of meditation and calm breathing techniques on working men's self-confidence. Thirty working males from Karaikudi, Tamilnadu, India, were chosen in 2020 to fulfill the study's objectives. The person is between the ages of 25 and 45. The chosen participants were split into two equal groups—the experimental group and the control group—each with 15 males. For six weeks, the experimental group participated in a program that blended meditation techniques with calm breathing exercises. Throughout the

trial, the control group did not participate in any training. A pre-test was administered prior to the training session, and a post-test was conducted just after the six-week training period. The means of the experimental group's and control group's pre-test and post-test data were analyzed using the statistical method known as the "t" ratio. The findings showed that the criteria variable showed a significant difference. When compared to the control group, the experimental group's self-confidence improved as a result of the combination of meditation and silent breathing techniques.

Amrutha, A., & Anand, D. (2020) examined "The impact of meditation and alternate nostril breathing on stress and aggression in female university students." The current study set out to determine how meditation and alternate nostril breathing techniques affected psychological factors (aggression and stress). Forty-five female students from different departments at Annamalai University in Annamalai Nagar, Chidambaram, were chosen at random to serve as subjects in order to accomplish this goal. Additionally, they range in age from 18 to 25. They were split up into three equal groups: the control group, the meditation group, and the alternate nostril breathing group. The meditation and alternate nostril breathing groups trained for the full six weeks. All subjects took the pre-test and the post-test prior to and following the training, respectively. The dependent T-test and analysis of covariance (ANCOVA) were used to analyze the data related to the variables in this. During the six weeks, the students' psychological factors improved through group meditation and alternate nostril breathing exercises.

Biju, L. K. (2020) examined the "impact of yoga nidra and cyclic meditation on specific psychological and physiological variables of collegiate athletes."Eighty athletes, aged 17 to 25, both male and female, were chosen for the research from Calicut University. Twelve weeks of training. psychological factors such as self-confidence, physical anxiety, and cognitive anxiety, among others. Systolic blood pressure, respiration rate, pulse rate, and other physiological indicators were measured. Ancona was employed as a statistical instrument. In every group, the outcome was significant for every chosen variable.

Bhatta, S., & Kumar, P. (2000) investigated the effects of yoga nidra on human brain rhythms. Finding out how yoga relaxation affected the patients' blood pressure, heart rate, respiration rate, mental strain, and behavior was the aim of the study. Patients with hypertension who had sleep disturbances and ranged in age from 35 to 70 were the subjects of the trials. It was discovered that following the Yoga Nidra training, the blood pressure

returned to normal without the need for medication. Yoga Nidra is a yogic relaxation method that successfully restored the disrupted sleep without the need for tranquilizers. When the hypertension patients practiced Yoga Nidra, their heartbeats decreased. After the fourth week of the trial, the heartbeat was returned to its typical range of 70–75 beats per minute without the use of medication. After the last 30 Review of related literature therapy, the hypertension patients who had been experiencing sleep difficulties stopped experiencing them and were able to have 6-7 hours of undisturbed sleep. In addition, the respiratory rate decreased from 15-20 beats per minute before to Yoga Nidra therapy to 12-14 beats per minute.

Telles et.al (2000) The goal of the current study was to assess a claim made in ancient yoga literature that implies a mix of "calming" and "stimulating" techniques may be particularly beneficial for achieving mental stability. Two yoga techniques were compared: cyclic meditation, which combines "calming and stimulating" measures, and shavasan, which is a "calming" strategy. Before and after cyclic meditation (CM) and shavasan (SH) sessions, 40 male volunteers (group mean ± SD, 27.0 ± 5.7 years) had their oxygen intake, breath rate, and breath volume measured. The CM and SH sessions were separated by one day. The practice of yoga poses alternating with stretches of supine rest is known as cyclic meditation. The patient of SH spends the entire session in a supine posture.

Following both kinds of sessions, there was a significant increase in breath volume and a decrease in oxygen consumption and breath rate (2-factor ANOVA, paired t test). But following CM, there was a larger change in all three measures: (1) Breath rate dropped 18.0% after CM and 15.2% after SH; (2) oxygen consumption dropped 32.1% after CM compared to 10.1% after SH; and (3) breath volume rose 28.8% after CM and 15.9% after SH. These findings provide credence to the notion that arousal is decreased more by a combination of yoga poses and relaxation than by relaxation alone.

Poti, K., & Upadhye, J. A. (2019) examined the "impact of callisthenic exercise, pranayama, asanas, and meditation on physiological and psychological variables." Yoga Pranayama meditation will lower your chance of contracting several diseases that are a result of your daily lifestyle. Modern living has made our lives more convenient and comfortable, but at the expense of obesity, high blood pressure, and heart problems, we still live stressful and unhealthy lives. For this reason, numerous studies have found that yoga can help people feel calmer and more at peace both physically and mentally. Our meagre income causes us to

experience worry, anxiety, melancholy, and poor vitality. In situations where many things disrupt our lives, yoga can help us be more attentive and at peace.

Vinchurkar, S. A., & Nagendra, H. R. (2014) A brief awareness Attention Awareness Scale (MAAS) was used to assess the immediate effects of meditation practice on state awareness. A control group (n = 46) and a meditation group (n = 44) were randomly allocated to 90 participants, whose ages ranged from 21 to 34 years (group mean age ± SD; 24.2 ± 7.2 years). Two of the project coordinators were present to oversee the anonymous administration of MAAS in a classroom setting and to help participants as needed. The researcher used a matched controlled approach, conducting assessments both before and after the meditation exercise. None of the participants had ever meditated before. IBM SPSS 20 was used to analyze the data. The normality of the data was examined. For both groups' pre-post comparisons, the paired samples t-test was used. After practicing meditation, state MAAS ratings were noticeably higher than those of the control group. Cyclic meditation helps to improve awareness and relax the mind in just one session. This indicates that the person is paying more attention to their body, breath, and mind, which is proven to improve their higher mental processes.

Sukhsohale et al., (2012) Participants meditated while their physiological variables were measured at 15 and 30 minutes after the start of meditation. Fasting blood sugar was also measured using a glucometer. Both groups were similar in terms of age, body weight, BMI, waist-hip ratio, and fasting blood sugar levels. Although the difference in physiological changes between STM and LTM was not statistically significant ($P > 0.05$), significant changes were observed within the LTM group when comparing pre-meditation values to those at 15- and 30-minutes post-meditation. These findings indicate that long-term practice of Raja Yoga meditation may enhance basic cardio-respiratory functions by promoting parasympathetic dominance over sympathetic activity in the autonomic nervous system. After beginning meditation, participants' physiological indicators were examined 15 and 30 minutes later. A glucometer was also used to assess blood sugar levels during a fast. The age, body weight, BMI, waist-hip ratio, and fasting blood sugar levels of the two groups were comparable. While there was no statistically significant difference in the physiological changes between STM and LTM ($P > 0.05$), the LTM group showed substantial changes when comparing pre-meditation values to those at 15 and 30 minutes after meditation. According to these results, regular Raja Yoga meditation practice may improve fundamental

cardio-respiratory processes by encouraging parasympathetic dominance over sympathetic activity in the autonomic nerve system.

RESEARCH METHODOLOGY

Subject Selection: Forty-five male university-level athletes from the Gwalior district, ages 18 to 25, will be chosen. The team sports of basketball, football, and hockey will be represented among the participants.

Selection of Variables:

Dependent Variables

Physiological

- Alpha Brain Wave
- Resting Heart Rate
- Resting Respiratory Rate
- Galvanic Skin Response

The following are **Psychological** (mental) skills:

i. Relaxation ability

ii. Confidence building

iii. Anxiety

iv. Imagery ability

v. Concentration ability

vi. Goal Setting

vii. Motivation.

Independent Variables

1. Pranayama (Nadishodhana, Sheetli, Ujjayi, Bhramari)

2.Cyclic Meditation

Measures of Criteria:

Polar FT80 is used to measure resting heart rate (bpm).

Breaths per minute, or respiratory rate, is manually measured by tracking chest movement.

Medicaid Bio-feedback was used to record the alpha brain wave (μV).

GSR: A measurement taken from the palm or fingers to gauge sweat gland activity.

Bull's Mental Skills Questionnaire (1996) is used to evaluate mental skills; the findings are expressed as a percentage (%).

Data Collection: At baseline, six weeks, and twelve weeks, measurements will be made.

Statistical Technique: ANOVA and MANOVA will be apply.

EXPECTED OUTCOMES

The Pranayama and Cyclic Meditation treatments are expected to considerably improve a number of physiological and psychological markers in college athletes as compared to the control group. Improvements are anticipated physiologically in the form of reduced resting heart rate and respiratory rate, indicating improved cardiovascular and respiratory efficiency; improved galvanic skin response, reflecting better autonomic nervous system regulation; and increased alpha brain wave activity, indicating improved mental clarity and calmness. Psychologically, participants should have increased self-assurance, motivation, focus, goal-setting, visualization abilities, relaxation capacity, and decreased anxiety levels, all of which enhance mental clarity and performance preparation. Both the Pranayama and Cyclic Meditation groups are expected to show favourable psycho-physiological changes overall during the 12-week intervention, surpassing the control group in the majority of most of the measured variable

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